The rejection of Claims 1 and 2 under 35 USC 102(b) as being anticipated by or, in the alternative, under 35 USC 103(a) as being obvious over Yamada et al. is respectfully traversed.

The rejection of claims 1 and 2 under 35 USC 102 (b) as anticipated by or, in the alternative, under 35 USC 103(a) as obvious over Gingerich et al. or JP10-188970 is respectfully traversed.

With respect to both rejections, the Examiner acknowledges that the prior art does not specify the surface area of the heterogenite powder as claimed by the Applicants. The Examiner however states that because the prior art materials appear to be of the same chemical composition and produced in substantially the same manner that the prior art materials are substantially identical to the Applicants' claimed material. The Applicants respectfully disagree.

Yamada teaches heating a heterogenite compound after it has been formed at temperatures about 100°C and from 120-910°C. Col. 3, ll. 53 et seq. The Applicants method involves heating a cobalt hydroxide precipitate at a moderate temperature of 110°C in order to form a high-surface-area heterogenite material. *See*, Specification, p.3, ll. 1-6. Therefore, the Yamada process is not the same as process used by the Applicants.

Gingerich et al. teach heating a cobaltic precipitate at about 100°C to produce a heterogenite material having a particle size from about 2 to about 5 microns. Col. 5, ll. 52-61. Although the surface area of this material is not specified, it is possible to estimate the surface area from the particle size. Assuming spherical particles, the relationship between the particle size and surface area can be written as: $S=6/\rho M$, where S is the average surface area and M is the average particle size. *See attached,* Irani et al., Particle Size: Measurement, Interpretation, and Application, p. 128 (John Wiley & Sons, Inc. 1963). Using a density for heterogenite of 4.3 g/cm^3. (*See attached,* Mineral Data Sheet), the surface area for the heterogenite material produced by Gingerich et al. can be estimated to range from 0.7 to 0.3 m^2/g. This is at least two orders of magnitude lower than the surface area of the Applicants' claimed material.

With respect to JP '970, the abstract discloses forming a beta-CoOOH layer on a nickel hydroxide particle surface. The Applicants claim a heterogenite powder having a high surface area. Hence, the Applicants respectfully assert that JP '970 is not relevant to the Applicants' claimed invention.

Therefore, the Applicants respectfully assert that their claimed invention is not anticipated by or obvious in view of Yamada, Gingerich et al. or JP '970.

The rejection of claims 1 and 2 under 35 USC §103(a) as being unpatentable over Wei et al., or JP 11-60242 or 11-176433 is respectfully traversed. Despite acknowledging that none of the cited references teaches a high-surface-area heterogenite material as claimed by the Applicants, the Examiner asserts that heterogenite materials having a surface area within the range of the instant claims would fall within the purview of the materials described in the prior art. The Applicants respectfully disagree.

In order to support a *prima facie* case for obviousness, there must be some teaching or suggestion in the prior art to make the claimed invention. MPEP §2143 The Examiner has identified no such teaching nor suggestion for making a high-surface-area heterogenite material. Instead, the Examiner merely contends without support that one of ordinary skill in the art would be aware of the relationship between surface area and such parameters as particle size, density, and packing factors, and would have been able to control the particle size of the prior art heterogenite material through the control of one of these parameters. From this, the Examiner concludes that the making of heterogenite materials of a given surface area, such as the surface area recited in the instant claims, would have been well within the level of ordinary skill in the art. The Applicants respectfully assert that the Examiners' unsupported contention is insufficient to establish a *prima facie* case of obviousness. First, it is well established that the level of skill in the art cannot be relied upon to provide the suggestion to combine references. MPEP §2143.01. Second, it is also well established that the fact that the claimed invention is within the capabilities of one of ordinary skill in the art is not sufficient by itself to establish *prima facie* obviousness. *Id.* And third, the law provides that "[p]atentability shall not be negatived by the manner in which the invention was made." 35 USC 103(a).

The only teaching or suggestion for a high-surface-area heterogenite material in the record comes from the Applicants' specification. However, to use the Applicants' disclosure would be to engage in impermissible hindsight reconstruction. Therefore, the Applicants respectfully request that the Examiner provide documentary evidence to support the Examiner's contention. In the absence of such evidence, the Applicants respectfully assert that their claimed invention is not obvious in view of Wei et al., JP '242 or 'JP '433

In view of the foregoing response, it is believed that the Examiner's rejections have been overcome and that the application is in condition for allowance. Such action is earnestly solicited.

Respectfully submitted,

Robert F. Clark

Robert F. Clark
Reg. No. 33,853

OSRAM SYLVANIA Inc.
100 Endicott St.
Danvers, MA 01923

Particle Size: Measurement, Interpretation, and Application

Riyad R. Irani and Clayton F. Callis
Monsanto Chemical Company, St. Louis, Missouri

John Wiley & Sons, Inc., New York • London

Library of Congress Catalog Card Number: 63-16018
Printed in the United States of America

ton, Ohio, and the Arealometer and Speedar made by the Special Instruments Laboratory, Inc., Knoxville, Tenn.

AVERAGE PARTICLE SIZE FROM ADSORPTION METHODS

The basis for the measurement of an average particle size from adsorption methods is the fundamental relations between the size M, surface area per unit weight S, and volume per unit weight V of a particle. In general, if the weight of the particle is ω, then

$$S = \frac{\alpha M^2}{\omega} \tag{1}$$

$$\omega = \rho V = \rho\beta M^3 \tag{2}$$

where ρ is the density of the material and α and β are constants. From equations 1 and 2,

$$M = \frac{\alpha/\beta}{\rho S} \tag{3}$$

When a large number of particles are considered, average values for M and S are obtained. For spherical particles α and β are π and $\pi/6$ respectively, and the ratio α/β equals 6. Since a spherical particle has the smallest possible surface-to-volume ratio, any deviation from spherical shape will lead to an increase in the actual surface-to-volume ratio and yield an average particle size value that is smaller than the actual average particle size. The only exceptions to this general rule are perfect cubes. The effect of particle shape can be partially corrected for by knowledge of the actual shape of the particle under consideration. Unfortunately, powdered materials are usually composed of particles having a number of shapes. In these cases, an average value for the ratio α/β can be utilized to correct partially for the deviations.

Adsorption methods yield surface areas that include both the external surface of the particles and the internal surface due to pores, fissures, or cracks. Particles with significant internal-surface areas are usually called porous particles. Since there is no known way to easily separate the portion of the surface areas attributable to pores from the total surface area, adsorption methods can yield a physically meaningful average particle size only with nonporous materials. This is the most severe limitation of adsorption methods in particle size analysis. For porous materials it can lead to discrepancies of up to several orders of magnitude, with the particle size computed from adsorption methods always giving the smaller value. For example, over 90% of the total surface area of diatomaceous earth clay particles is due to their in-

Heterogenite-2H Mineral Data Pronunciation Guide

General Information

Chemical Formula: Co+++O(OH)

Composition: Molecular Weight = 91.94 gm

Cobalt	64.10 %	Co	90.20 %	Co_2O_3
Hydrogen	1.10 %	H	9.80 %	H_2O
Oxygen	34.80 %	O		
	------		------	
	100.00 %		100.00 %	= TOTAL OXIDE

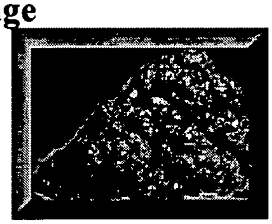
Empirical Formula: CoO(OH)

IMA Status: Approved IMA

Locality: Link to MinDat.org Location Data.

Heterogenite-2H Image

Images:



Shiny black botryoidal Heterogenite-2H. Star of the Congo mine, Katanga, Congo. 6cm. Photo by John Attard

Crystallography

Axial Ratios: a:c = 1:3.08406

Cell Dimensions: a = 2.855, c = 8.805, Z = 2; V = 62.15 Den(Calc)= 4.91

Crystal System: **Hexagonal - Dihexagonal Dipyramidal** H-M Symbol (6/m 2/m 2/m) Space Group: P63/mmc

X Ray Diffraction: By Intensity(I/I_0): 4.39(1) 1.236(0.9) 2.158(0.8)

Physical Properties

Cleavage: [0001] Good

Color: black or steel gray.

Density: 4.3

Diaphaniety: Opaque

Hardness: 3-4 - Calcite-Fluorite

Luster: Metallic

Streak: black

Classification

Dana Class: **6.1.4.1** (6)Hydroxides and Oxides Containing Hydroxyl
(6.1)where X+++O OH
(6.1.4)Dana Group

6.1.4.1 Heterogenite-2H CoO(OH) P63/mmc 6/m 2/m 2/m
6.1.4.2 Heterogenite-3R CoO(OH) R3m- -3 2/m
6.1.4.3 Feitknechtite beta-MnO(OH) Unk Hex
6.1.4.4 Feroxyhyte FeO(OH) Unk Hex

Strunz Class: **IV/F.07-30** IV - Oxides
IV/F - Hydroxides and oxidic hydrates, water-bearing oxides with layered structure

IV/F.07 - STRUNZ IV/F.07-30 - Oxides [Hydroxides and oxidic hydrates, water-bearing oxides with layered structure {Lithiophorite - Grimaldiite series}]

IV/F.07-10 LithiophoriteAl14Li6(OH)42Mn3Mn18O42R3m- -3 2/m
IV/F.07-20 Asbolane(Co,Ni)1-y(MnO2)2-x(OH)2-2y2x·n(H2O) Unk Hex
IV/F.07-30 Heterogenite-2H CoO(OH) P63/mmc 6/m 2/m 2/m
IV/F.07-40 Heterogenite-3R CoO(OH) R3m- -3 2/m
IV/F.07-50 BracewelliteCrO(OH) Pbnm 2/m 2/m 2/m
IV/F.07-60 GuyanaiteCrO(OH) Pnnm 2/m 2/m 2/m
IV/F.07-70 Grimaldiite CrO(OH)R3m- -3 2/m

Other Information

References: PHYS. PROP.(Enc. of Minerals,2nd ed.,1990)

See Also: **Links to other databases for Heterogenite-2H :**
1 - EUROmin Project 2 -MinMax

Search for Heterogenite-2H using:
[ALTAVISTA] [All-The-Web] [EXCITE] [GO.COM] [GOOGLE] [Ixquick] [LYCOS] [LookSmart] [MAMMA] [MSN.COM] [NORTHERN LIGHT] [YAHOO]

Ask about Heterogenite-2H here :
Mindat.org's Discussion Groups
Mindat.org's Collecting Discussion Group
Mindat.org's General Discussion Group
Mindat.org's Swap Shop Discussion Group
Bob's Rockshop Rock Net Discussion Group
Rockhounds Discussion Group on Yahoo Groups
Ask-A-Mineralogist from the Mineralogical Society of America